Performance Optimization of Interactive, Personal Content Distribution

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I. Introduction

Two trends are clearly visible for the current consumption of digital information. On the one hand, the number and diversity of digital services is rapidly increasing as interactive applications are added to the digital multimedia. On the other hand, more and more telecommunication and broadcast networks are being built up. This Ph.D. research was defined in order to provide an answer to the performance issues that arise when deploying interactive services in the current, quickly changing digital environment. This optimising not only focusses on the network related aspects but also encompasses the search for better interaction and the design of service platforms for the transparent deployment of digital services in heterogeneous environments. Based on the knowledge gained from deploying these interactive services, this Ph.D will also focus on the research for and the deployment of better personalisation algorithms and mechanisms. Personalised services are services that are specifically tailored to the consumer's intereats. In the following sections, each research track of this Ph.D. will be further detailed.

II. Efficient Heterogeneous Distribution

As already stated in the introduction, more and more telecommunication and broadcast networks are being built up. Think of networks such as Wimax, xDSL, DVB-H, DVB-SH, DVB-T2, etc. These networks may have very different characteristics (low vs. high bandwidth, unidirectional vs. bidirectional, reliable vs. best-effort, etc.). This huge variety in available networks and related business models has also led to significant differences in end-user devices. These range from fixed devices such as high-end PCs or set-top boxes (STB) to wireless, portable or handheld devices. All these devices have very different characteristics in terms of screen size, network interface, user interaction model, etc. This diversity exists nowadays and is expected to keep growing. This has a great influence on content providers as it will become more and more difficult to continuously adapt their production system to the increasingly complex world of heterogeneous digital networks and the associated service platforms. A factor that highly complicates this continuous adaption is the need for highly interactive content. To this end, this research track has been defined to design a middleware platform for the transparent distribution of interactive content over multiple networks and to different types of devices. This middleware platform has already been implemented and is described in [1]. As shown in Figure 1 it was tested in a use case scenario where the same interactive content (a live quiz show) is deliverd to both a digital TV STB and a mobile phone. On both devices, the user was able to experience exactly the same type of interactivity.

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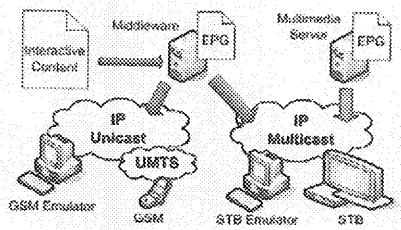

Figure 1. Interactivity on STB and mobile phone.

III. Synchronisation and DVB-H

Tightly coupled with the deployment of interactive services, is the need for synchronisation. This synchronisation between the broadcasted audio/video and the interactive services is essential in order to provide a good Quality of Experience (QoE) of the interactive service to the end user. A question field that appears on the screen before the quiz master actually poses the question is a simple example of bad synchronisation. In [2] a synchronisation mechanism is described for the delivery of synchronised services for mobile devices over IPDC/DVB-H and UMTS. The Digital Video Broadcast-Handheld (DVB-H) specification is the European standard for mobile television while IP Datacast (IPDC) over DVB-H integrates DVB-H in a hybrid network structure consisting of both a mobile communications network such as UMTS and a DVB-H downstream.

Based on the practical experience with DVB-H and DVB-IPDC, extensive research tests are currently executed for defining the DVB-H specific network characteristics. In these tests, packet loss and jitter (the variation in network delay) are induced in the network and their effect on the video quality is measured by some typical QoE measurement techniques such as PSNR and SSIM.

IV. Personalisation

As interactive TV streaming over IP is gaining importance at the expense of the traditional media, the advertising market is going through some radical changes. New use cases such as interactive advertising are slowly becoming an every day reality. However, as devices with PVR functionality are also finding their way to the consumers houses, advertisements may be skipped and major revenues may be lost. By making advertisements more personalised, they become more appealing to the user which increases their efficiency and makes them less skipped. Personalised advertising refers to the individual targeting of each consumer by only showing them those advertisements they may be interested in. Personalised services are implemented by using profiles and profiling algorithms. Every user has his own profile which contains his interests, the types of advertisements he likes, etc. In this research track, focus is on the implementation of better personalisation algorithms for DTV and on the deployment of these services in existing or new network architectures. In [3], a service architecture for the deployment of personalised iDTV services over DSL networks is described.

V. Conclusions

Performance optimisation of interactive and personalised services is a research challenge that encompasses several approaches and different research domains. In this Ph.D. some of these research tracks have already been completed but there is still a long and major effort that need to be made in the domain of optimisation of personalised services . I hope to successfully complete this research goal in the following years of my Ph.D.

References

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[3] P. Leroux , V. Verbrugghe, F. De Turck and P. Demeester, *Efficient Deployment of Personalised iDTV Advertising over DSL Networks* Adjunct Proc. EuroiTV 2008.

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